direct image and successive spectral images, locating the wave-lengths by noting the positions of stars on their corresponding stellar spectra. Only two portions of the nebula were dense enough to give results—the brightest part, a wedge-shaped mass on the north following edge pointing to south following, and a fairly bright edge on the south preceding side.

The following bright-line images could be seen:

N_1	$H\gamma$
N_2	$H\delta$
$H\beta$	$H\epsilon$
$\lambda 4686$	

$H\beta$ and $H\gamma$ were about equally bright and about twice the intensity of the others, which were too faint to be readily arranged in order of brightness.

The 6° prism showed an additional blurred image, easily the brightest of the entire spectrum near the head of the hydrogen series. This was first thought to be due to the nebular lines at $\lambda 3727$. Higher dispersion, however, broadened and weakened this image and presented it as a continuous spectrum beginning, as near as could be determined, at the head of hydrogen series and extending in the direction of decreasing wave-length. These strong ultra-violet radiations probably account for the fact that the bright line images are sharper in detail than the direct photographs.

Wright[2] has recently discussed this type of continuous spectrum, and has given reasons for thinking it due to the Balmer series of hydrogen. Altho he specifically refers to it only in describing spectra of planetaries, he remarks that it exists in many gaseous nebulae. In the light of Wright's discussion the phenomenon may be considered as one of the points of resemblance between the physical conditions existing in planetaries and in the great gaseous nebulae.

EDWIN P. HUBBLE.

W VIRGINIS

The typical Cepheid variable of the galactic system, with period of light variation greater than a day, is commonly found relatively

[2] *Publications of the Lick Observatory*, Vol. XIII, part VI.

close to the plane of the Milky Way. For 94 variables of this kind, whose distances and distribution in space are derived and discussed in *Mt. Wilson Contr.*, No. 153, the average distance from the galactic plane is only 150 parsecs, while for more than two-thirds of them the distance along the plane is in excess of 1000 parsecs.

In contrast to this remarkable galactic concentration of the typical Cepheid variable, many members of the other principal group of Cepheids (the "cluster" type, with periods less than a day), are found in high galactic latitude and linearly very far from the mid-galactic stellar regions. The average distance from the plane for 45 such variables is about 1000 parsecs.

The greatest radial distance from the Sun heretofore recorded for Cepheids of either group is 5880 parsecs, and the maximum distance from the plane is 5240 parsecs (RU *Bootis*, *Pub. A. S. P.*, **29**, 183, 1917).

A few faint variables that may be Cepheids of long period are found in high galactic latitude (*Mt. Wilson Contr.*, No. 153, Table II), but peculiarities of their light curves, periods or spectra, make it doubtful if their distances can be derived by means of the period-luminosity curve (*Mt. Wilson Contr.*, No. 151, Figure 1 and Table XI). Recent work on one of these stars, however, appears to establish its typical character and gives us the first galactic Cepheid of long period distinctly outside the equatorial section of the Milky Way. (There are, of course, many Cepheids of both groups in high galactic latitude in globular clusters, at enormous distances from the Milky Way.)

W *Virginis*, discovered by Schönfeld 54 years ago and since then the subject of more than twenty scientific papers, appears from the accurate photometric observations by Wendell at Harvard and from the recent discussion of the Harvard photographs by Chant (*Harvard Annals*, **80**, 221) to be a normal Cepheid variable with a period of 17.113 days. Some of the earlier observers obtained from visual estimates evidence of a symmetrical curve, others thought they found a pronounced secondary maximum. Neither of these characteristics appears in later investigations. As Chant's recent study of plates, extending over an interval of 25 years, is by far the most extensive investigation of the star, we may accept, for the present at least, his conclusion that the variability is typical.

From the equatorial co-ordinates, the photometric data, and the period-luminosity law we derive:

Galactic longitude		296°
Galactic latitude		+57°
Median apparent visual magnitude		10.3
Logarithm of the period		1.237
Absolute visual magnitude		−4.0
Radial distance from the Sun	parsecs	7,100
Distance projected on the galactic plane	parsecs	3,900
Distance from the galactic plane	parsecs	+6,000

From these results it appears that W *Virginis* is not only the most remote galactic Cepheid for which a distance has been definitely estimated, but is also at the greatest distance from the galactic plane as yet found for any isolated star.

HARLOW SHAPLEY

THE PARALLAXES OF N. G. C. 40 AND N. G. C. 2022.

The parallaxes of these two planetary nebulae were recently determined from 14 and 16 exposures, respectively. The results are:

$$\text{N. G. C. } 40 \quad \pi_{\text{rel}} = 0''.000 \pm 0''.003$$
$$\text{N. G. C. } 2022 \quad \pi_{\text{rel}} = +0''.008 \pm 0''.004$$

To obtain absolute parallaxes about 0″.002 should be added to the relative values. The angular diameters given by Curtis are 60″ and 28″; his estimates of the photographic magnitude of the central stars are 10 and 13.

A. VAN MAANEN.

THE SPECTRUM OF THE COMPANION TO CASTOR AND OF W. B. 16^h 906.

Common proper motion of 0″.20 links the 9.5 magnitude companion to *Castor* ($7^h28^m.2$, $+32°.6'$: 1900) altho its distance is 73″. Also Fox[1] has found the parallax to be 0″.114, which is comparable with, 0″.075, the mean found by several observers for the components of *Castor* itself.

The spectrum of the companion has been photographed at this observatory for determining its absolute magnitude and parallax. Plates taken in 1916 with the 7-inch camera and 60-inch telescope indicated that the star was a binary of late type with both com-

[1] *C. R.* **168**, 1096.